Substructure Repair Procedures And Service Lives

STUDY PROPOSAL FOR RESEARCH PROJECT 222-1

JANUARY 1994

ENGINEERING RESEARCH AND DEVELOPMENT BUREAU
NEW YORK STATE DEPARTMENT OF TRANSPORTATION
Mario M. Cuomo, Governor/John C. Egan, Commissioner

A. Identification

Study Title:	SUBSTRUCTURE REPAIR PROCEDURES AND SERVICE LIVES Research Project 222-1
Agency:	Engineering Research and Development Bureau New York State Department of Transportation State Campus, Albany, New York 12232
Principal Investigator:	Ronald A. Lorini Civil Engineer I
Research Supervisor:	Wei-Shih Yang, Ph.D. Engineering Research Specialist II

B. Problem Statement

In recent years, substructure repair of bridges has become increasingly common in New York, largely because of the presence of soluble chlorides from winter deicing salts. These chlorides from leaking joints and road spray penetrate substructure elements, resulting in corrosion, delamination, and spalling. Conventional concrete (and in some cases shotcrete) is used for repair of larger distressed areas. Concrete patching materials, including various types of vertical patching mixes and concrete with super-plasticizers, are used in smaller areas. Shrinkage cracking and debonding of all these materials have been reported.

C. Objective

A literature search will be conducted to identify any ongoing projects in New York and other states with similar climate and highway conditions that may be relevant to this project. The objective is to develop improved methods and/or materials for substructure repairs, with special attention to the impact of cracking on repairs. This study will help develop greater understanding of the performance of current repair methods, as well as improved materials and/or methods.

NYSDOT
Library
50 Wolf Road, POD 34
Albany, New York 12232

D. Background

Maintenance and repair of substructure elements can be complex, time-consuming, and costly. Numerous techniques have been used with varying degrees of success. This project will consider all types of maintenance and repair work on bridge substructures, and report on techniques, materials, and their effectiveness.

E. Benefits

The work is directly applicable to New York's needs, and may also prove beneficial to other states with similar climate and highway conditions. The final report will include an evaluation of New York's current practices and materials, as well as a survey of repairs on New York bridges.

F. Implementation

New or improved methods and/or materials for substructure repairs will be implemented by the Highway Maintenance Division. In the event that new methods or materials are identified, the Materials Bureau will revise specifications and issue a new list of approved materials.

G. Work Plan

A literature search of various types of products and techniques used in New York and other states will be conducted and reviewed. Current practices for repair of substructure concrete include conventional concrete, shotcrete, and concrete patching materials, including various types of vertical patching materials and concrete with superplasticizers. Surveys will be conducted to determine the adequacy of current repair procedures, especially the impact of cracking on those repairs. Data collected in the field will be statistically analyzed, with results and recommendations published in a final report. This project is expected to last about 24 months.

H. Report

A report will be prepared to document field evaluations, results, and conclusions. It will be published and the information made available to the Department, FHWA, and other interested agencies.

D. Background

Maintenance and repair of substructure elements can be complex, time-consuming, and costly. Numerous techniques have been used with varying degrees of success. This project will consider all types of maintenance and repair work on bridge substructures, and report on techniques, materials, and their effectiveness.

E. Benefits

The work is directly applicable to New York's needs, and may also prove beneficial to other states with similar climate and highway conditions. The final report will include an evaluation of New York's current practices and materials, as well as a survey of repairs on New York bridges.

F. Implementation

New or improved methods and/or materials for substructure repairs will be implemented by the Highway Maintenance Division. In the event that new methods or materials are identified, the Materials Bureau will revise specifications and issue a new list of approved materials.

G. Work Plan

A literature search of various types of products and techniques used in New York and other states will be conducted and reviewed. Current practices for repair of substructure concrete include conventional concrete, shotcrete, and concrete patching materials, including various types of vertical patching materials and concrete with superplasticizers. Surveys will be conducted to determine the adequacy of current repair procedures, especially the impact of cracking on those repairs. Data collected in the field will be statistically analyzed, with results and recommendations published in a final report. This project is expected to last about 24 months.

H. Report

A report will be prepared to document field evaluations, results, and conclusions. It will be published and the information made available to the Department, FHWA, and other interested agencies.

I. Manpower and Budget Estimate

This project will be conducted under general supervision of Dr. Robert J. Perry, Director of Engineering Research and Development. It will be directed by Wei-Shih Yang, Engineering Research Specialist II. The principal investigator will be Ronald A. Lorini, Civil Engineer I. Technicians will be assigned as needed. Personnel and budgeting details are given in Tables 1, 2, and 3.

Table 1. Skill level and project duration (person/weeks).

	FY 93-4									FY 94-5												FY 95-6		
Staff	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
ERS II		1						1											1				1	
ERS I	1	1						1	1		1								1				1	
CE I	1	1	1	2	4	4	4	2	2	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1
PET				1	4	4	4	1									1	1						
STAT		1							2												2			

Table 2. Functions and skill levels.

Task	ERS II	ERS I	CE I	PET	STAT
Literature Search	1	1	4		
Study Proposal	1	2	4		1
Field Surveys*			12	12	
Data Analysis	1	2	10	4	4
Report Writing	1	2	10		
Total (persons/weeks)	4	7	40	16	5
Estimated Cost	$8,000	$12,000	$41,000	$15,000	$10,000
Total Estimated Cost				$86,000	

* Includes preparing the field study.

Table 3. Budget estimate

Item	FY 93-4	FY 94-5	FY 95-6	TOTAL
Personal Service	$38,000	$40,000	$8,000	$86,000
Travel	$15,000	$ 5,000		$20,000
Totals	$53,000	$45,000	$8,000	$106,000

I. Manpower and Budget Estimate

This project will be conducted under general supervision of Dr. Robert J. Ferry, Director of Engineering Research and Development. It will be directed by Wei-Shih Yang, Engineering Research Specialist II. The principal investigator will be Ronald A. Lorini, Civil Engineer I., Technicians will be assigned as needed. Personnel and budgeting details are given in Tables 1, 2, and 3.

Table 1. Skill level and project duration (person/weeks).

	FY 93-4												FY 94-5												FY 95-6		
Stat:	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
ERS II								1												1				1
ERS I		1	1					1	1											1				1
CE I	1	1	1	2	4	4	4	2	2	1	1	1	1	1	1	2	2	2	2	1	1	1	1	1
PET				1	4	4	4	1									1	1						
STAT			1						2												2			

Table 2. Functions and skill levels.

Task	ERS II	ERS I	CE I	PET	STAT
Literature Search	1	1	4		
Study Proposal	1	2	4		1
Field Surveys*			12	12	
Data Analysis	1	2	10	4	4
Report Writing	1	2	10		
Total (persons/weeks)	4	7	40	16	5
Estimated Cost	$8,000	$12,000	$41,000	$15,000	$10,000
Total Estimated Cost				$86,000	

* Includes preparing the field study.

Table 3. Budget estimate

Item	FY 93-4	FY 94-5	FY 95-6	TOTAL
Personal Service	$38,000	$40,000	$8,000	$86,000
Travel	$15,000	$ 5,000		$20,000
Totals	$53,000	$45,000	$8,000	$106,000

01612
LRI